

VI. What Is Claimed Is:

1           1.       A method of scheduling the transmission of data from  
2 an access point to a plurality of access terminals serviced by  
3 the access point using the corresponding forward communication  
4 links between the access point and the access terminals in a  
5 CDMA/HDR communications network, comprising:

6       the access point calculating a scheduling parameter for  
7           each of the forward communication links and access  
8           terminals as a function of a plurality of operating  
9           parameters; and  
10       the access point scheduling data for transmission to the  
11           access terminal having the largest scheduling  
12           parameter.

2. The method of claim 1, wherein the access point calculates the scheduling parameter for each of the forward communication links and access terminals as a function of a frame utilization for the corresponding forward communication link and access terminal.

1           3.     The method of claim 2, wherein the frame utilization  
2     is calculated as a function of a size of a data payload available  
3     to send to the corresponding access terminal and a size of the  
4     physical layer packet for the corresponding access terminal.

1           4.     The method of claim 2, wherein the access point  
2     calculates the frame utilization  $U_{FRAMEi}$  for the  $i$ th forward  
3     communication link and access terminal using the following  
4     expression:

$$U_{FRAMEi} = DPA_i / PS_i ;$$

[illegible]

8 to the  $i$ th access terminal;  
9 and  
10  $PS_i$  = the physical layer packet  
11 size corresponding to a  
12 maximum data transmission  
13 rate for the  $i$ th access  
14 terminal.

1 5. The method of claim 2, wherein the access point  
2 calculates the scheduling parameter for each of the forward  
3 communication links and access terminals as a function of the  
4 frame utilization, a maximum data transmission rate, and an  
5 average data transmission rate for the corresponding forward  
6 communication link and access terminal.

1 6. The method of claim 5, wherein the frame utilization  
2 is calculated as a function of a size of a data payload available  
3 to send to the corresponding access terminal and a size of the  
4 physical layer packet for the corresponding access terminal.

1 7. The method of claim 5, wherein the access point  
2 calculates the frame utilization  $U_{FRAMEi}$  for the  $i$ th forward  
3 communication link and access terminal using the following  
4 expression:

5 
$$U_{FRAMEi} = DPA_i / PS_i;$$

6 wherein  $DPA_i$  = the size of the data  
7 payload available to send  
8 to the  $i$ th access terminal;  
9 and  
10  $PS_i$  = the physical layer packet  
11 size corresponding to a  
12 maximum data transmission  
13 rate for the  $i$ th access  
14 terminal.

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14  $R_{AVGi}$  = the average data transmission  
15 rate for the  $i$ th forward  
16 communication link for the  $i$ th  
17 corresponding  $i$ th access  
18 terminal for a predetermined  
19 time period; and  
20  $U_{FRAMEi}$  = the frame utilization for the  $i$ th  
21 forward communication link for the  
22 corresponding  $i$ th access terminal.

1 12. The method of claim 11, wherein the access point  
2 calculates the frame utilization  $U_{FRAMEi}$  for the  $i$ th forward  
3 communication link and access terminal using the following  
4 expression:

5 
$$U_{FRAMEi} = DPA_i / PS_i;$$

6 wherein  $DPA_i$  = the size of the data  
7 payload available to send  
8 to the  $i$ th access terminal;  
9 and  
10  $PS_i$  = the physical layer packet  
11 size corresponding to  $R_{MAXi}$ .

1 13. A communications network, comprising:  
2 a plurality of access terminals; and  
3 an access point operably coupled to the access terminals by  
4 a plurality of corresponding forward communication  
5 links;  
6 wherein the access point is adapted to calculate a  
7 scheduling parameter for each of the forward  
8 communication links and access terminals as a function  
9 of a plurality of operating parameters; and

1        wherein the access point is adapted to schedule data for  
2                transmission to the access terminal having the largest  
3                scheduling parameter.

1           14. The communications network of claim 13, wherein the  
2 access point is adapted to calculate the scheduling parameter for  
3 each of the forward communication links and access terminals as a  
4 function of a frame utilization for the corresponding forward  
5 communication link and access terminal.

1           15. The communications network of claim 14, wherein the  
2 frame utilization is calculated as a function of a size of a data  
3 payload available to send to the corresponding access terminal  
4 and a size of the physical layer packet for the corresponding  
5 access terminal.

1           16. The communications network of claim 14, wherein the  
2 access point is adapted to calculate the frame utilization  $U_{FRAME,i}$   
3 for the  $i$ th forward communication link and access terminal using  
4 the following expression:

$$U_{FRAMEi} = DPA_i / PS_i;$$

6            wherein

7                 DPA<sub>i</sub>

=

the size of the data  
payload available to send  
to the ith access terminal;  
and

PS<sub>i</sub>

=

the physical layer packet  
size corresponding to a  
maximum data transmission  
rate for the ith access  
terminal.

1           17. The communications network of claim 14, wherein the  
2   access point is adapted to calculate the scheduling parameter for  
3   each of the forward communication links and access terminals as a

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4 function of the frame utilization, a maximum data transmission  
5 rate, and an average data transmission rate for the corresponding  
6 forward communication link and access terminal.

1           18.    The communications network of claim 17, wherein the  
2    frame utilization is calculated as a function of a size of a data  
3    payload available to send to the corresponding access terminal  
4    and a size of the physical layer packet for the corresponding  
5    access terminal.

1           19. The communications network of claim 17, wherein the  
2 access point is adapted to calculate the frame utilization  $U_{FRAMEi}$   
3 for the  $i$ th forward communication link and access terminal using  
4 the following expression:

$$U_{FRAMEi} = DPA_i / PS_i ;$$

[illegible]

20. The communications network of claim 13, wherein the access point is adapted to calculate the scheduling parameter for each of the forward communication links and access terminals as a function of one or more weighting factors, a maximum data transmission rate, and an average data transmission rate for the corresponding forward communication link and access terminal.

1        21. The communications network of claim 20, wherein the  
2        weighting factors are selected from the group consisting of:

3       a frame utilization for the corresponding forward  
4           communication link and access terminal; and  
5       a priority of the data to be transmitted to the  
6           corresponding access terminal.

1           22. The communications network of claim 13, wherein the  
2 access point is adapted to calculate the scheduling parameter for  
3 each of the forward communication links and access terminals as a  
4 function of a priority of the data to be sent to the  
5 corresponding access terminal.

23. The communications network of claim 13, wherein the access point is adapted to calculate a scheduling parameter  $P_i$  for an  $i$ th access terminal and forward communication link using the following expression:

$$P_i = (R_{MAXi} / R_{AVGi}) * U_{FRAMEi};$$

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6      wherein  $P_i$  = the scheduling parameter for the
7
8      ith forward communication link
9      for the corresponding ith access
10
11      terminal;
12
13       $R_{MAXi}$  = the maximum data transmission
14
15      rate for the ith forward
16      communication link for the
17      corresponding ith access
18      terminal;
19
20       $R_{AVGi}$  = the average data transmission
21
22      rate for the ith forward
23      communication link for the ith
24      corresponding ith access
25      terminal for a predetermined
26      time period; and
27
28       $U_{FRAMEi}$  = the frame utilization for the ith
29
30      forward communication link for the
31      corresponding ith access terminal.

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1           24. The communications network of claim 23, wherein the  
2 access point is adapted to calculate the frame utilization  $U_{FRAMEi}$   
3 for the  $i$ th forward communication link and access terminal using  
4 the following expression:

$$5 \quad U_{FRAMEi} = DPA_i / PS_i ;$$

[illegible]

1           25.     A computer program for scheduling the transmission of  
2 data from an access point to a plurality of access terminals  
3 serviced by the access point using the corresponding forward  
4 communication links between the access point and the access  
5 terminals in a CDMA/HDR communications network, comprising  
6 instructions for:

7       the access point calculating a scheduling parameter for  
8       each of the forward communication links and access  
9       terminals as a function of a plurality of operating  
10      parameters; and

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11         the access point scheduling data for transmission to the
12         access terminal having the largest scheduling
13         parameter.

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1           26. The computer program of claim 25, wherein the access  
2 point calculates the scheduling parameter for each of the forward  
3 communication links and access terminals as a function of a frame  
4 utilization for the corresponding forward communication link and  
5 access terminal.



1           27. The computer program of claim 26, wherein the frame  
2 utilization is calculated as a function of a size of a data  
3 payload available to send to the corresponding access terminal  
4 and a size of the physical layer packet for the corresponding  
5 access terminal.

1           28. The computer program of claim 26, wherein the access  
2 point calculates the frame utilization  $U_{\text{FRAME}i}$  for the  $i$ th forward  
3 communication link and access terminal using the following  
4 expression:

$$U_{FRAMEi} = DPA_i / PS_i ;$$

6            wherein                  $DPA_i$                  =            the size of the data  
7    payload available to send  
8    to the  $i$ th access terminal;  
9    and  
10      $PS_i$                  =            the physical layer packet  
11    size corresponding to a  
12    maximum data transmission  
13    rate for the  $i$ th access  
14    terminal.

1        29. The computer program of claim 26, wherein the access  
2 point calculates the scheduling parameter for each of the forward  
3 communication links and access terminals as a function of the  
4 frame utilization, a maximum data transmission rate, and an  
5 average data transmission rate for the corresponding forward  
6 communication link and access terminal.

1           30. The computer program of claim 29, wherein the frame  
2 utilization is calculated as a function of a size of a data  
3 payload available to send to the corresponding access terminal  
4 and a size of the physical layer packet for the corresponding  
5 access terminal.

$$5 \quad U_{FRAMEi} = DPA_i / PS_i ;$$

1           32. The computer program of claim 25, wherein the access  
2 point calculates the scheduling parameter for each of the forward  
3 communication links and access terminals as a function of one or  
4 more weighting factors, a maximum data transmission rate, and an  
5 average data transmission rate for the corresponding forward  
6 communication link and access terminal.

1        33. The computer program of claim 32, wherein the  
2        weighting factors are selected from the group consisting of:  
3        a frame utilization for the corresponding forward  
4        communication link and access terminal; and  
5        a priority of the data to be transmitted to the  
6        corresponding access terminal.

1           34. The computer program of claim 25, wherein the access  
2 point calculates the scheduling parameter for each of the forward  
3 communication links and access terminals as a function of a  
4 priority of the data to be sent to the corresponding access  
5 terminal.

[illegible]

6            wherein     $P_i$             =        the scheduling parameter for the  
7    ith forward communication link  
8    for the corresponding ith access  
9    terminal;

15                    $R_{AVGi}$  =                 the average data transmission  
16    rate for the ith forward  
17    communication link for the ith  
18    corresponding ith access  
19    terminal for a predetermined  
20    time period; and

1           36. The computer program of claim 35, wherein the access  
2 point calculates the frame utilization  $U_{FRAMEi}$  for the  $i$ th forward  
3 communication link and access terminal using the following  
4 expression:

```
6         wherein          DPAi      =    the size of the data
7                                         payload available to send
8                                         to the ith access terminal;
9                                         and
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PS<sub>i</sub> = the physical layer packet  
size corresponding to R<sub>MAX*i*</sub>.

1 37. A communications network, comprising:  
2 a plurality of access terminals;  
3 an access point operably coupled to the access terminals by  
4 a plurality of corresponding forward communication  
5 links;  
6 means for calculating a scheduling parameter for each of  
7 the forward communication links and access terminals  
8 as a function of a plurality of operating parameters;  
9 and  
10 means for scheduling data for transmission to the access  
11 terminal having the largest scheduling parameter.

1           38.   The communications network of claim 37, further  
2 comprising:  
3           means for calculating the scheduling parameter for each of  
4           the forward communication links and access terminals  
5           as a function of a frame utilization for the  
6           corresponding forward communication link and access  
7           terminal.

1        39. The communications network of claim 38, further  
2 comprising:  
3        means for calculating the frame utilization as a function  
4        of a size of a data payload available to send to the  
5        corresponding access terminal and a size of the  
6        physical layer packet for the corresponding access  
7        terminal.

1           40. The communications network of claim 38, further  
2 comprising:

means for calculating the frame utilization  $U_{FRAMEi}$  for the  
ith forward communication link and access terminal  
using the following expression:

$$U_{FRAMEi} = DPA_i / PS_i;$$

wherein  $DPA_i$  = the size of the data  
payload available to send  
to the ith access terminal;  
and  
 $PS_i$  = the physical layer packet  
size corresponding to a  
maximum data transmission  
rate for the ith access  
terminal.

41. The communications network of claim 38, further  
comprising: means for calculating the scheduling parameter  
for each of the forward communication links  
and access terminals as a function of the  
frame utilization, a maximum data  
transmission rate, and an average data  
transmission rate for the corresponding  
forward communication link and access  
terminal.

42. The communications network of claim 41, further  
comprising:  
means for calculating the frame utilization as a function  
of a size of a data payload available to send to the  
corresponding access terminal and a size of the  
physical layer packet for the corresponding access  
terminal.

43. The communications network of claim 41, further  
comprising:

means for calculating the frame utilization  $U_{FRAMEi}$  for the  
ith forward communication link and access terminal  
using the following expression:

$$U_{FRAMEi} = DPA_i / PS_i;$$

wherein  $DPA_i$  = the size of the data  
payload available to send  
to the ith access terminal;  
and  
 $PS_i$  = the physical layer packet  
size corresponding to a  
maximum data transmission  
rate for the ith access  
terminal.

44. The communications network of claim 37, further  
comprising:  
means for calculating the scheduling parameter for each of  
the forward communication links and access terminals  
as a function of one or more weighting factors, a  
maximum data transmission rate, and an average data  
transmission rate for the corresponding forward  
communication link and access terminal.

45. The communications network of claim 44, wherein the  
weighting factors are selected from the group consisting of:  
a frame utilization for the corresponding forward  
communication link and access terminal; and  
a priority of the data to be transmitted to the  
corresponding access terminal.

46. The communications network of claim 37, further  
comprising:  
means for calculating the scheduling parameter for each of  
the forward communication links and access terminals

5 as a function of a priority of the data to be sent to  
6 the corresponding access terminal.

1           47. The communications network of claim 37, further  
2 comprising:

3 means for calculating a scheduling parameter  $P_i$  for an  $i$ th  
4 access terminal and forward communication link using  
5 the following expression:

$$P_i = (R_{MAXi} / R_{AVGi}) * U_{FRAMEi};$$

7            wherein     $P_i$             =        the scheduling parameter for the  
8    ith forward communication link  
9    for the corresponding ith access  
10    terminal;

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11          $R_{MAXi}$            =      the maximum data transmission
12                                rate for the ith forward
13                                communication link for the
14                                corresponding ith access
15                                terminal;

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16  $R_{AVGi}$  = the average data transmission  
17 rate for the  $i$ th forward  
18 communication link for the  $i$ th  
19 corresponding  $i$ th access  
20 terminal for a predetermined  
21 time period; and

22                     $U_{FRAMEi}$  =        the frame utilization for the  $i$ th  
23                                        forward communication link for the  
24                                        corresponding  $i$ th access terminal.

1        48.    The communications network of claim 47, further  
2 comprising:

3 means for calculating the frame utilization  $U_{FRAMEi}$  for the  
4  $i$ th forward communication link and access terminal  
5 using the following expression:

$$U_{FRAMEi} = DPA_i / PS_i;$$

7                wherein                DPA<sub>i</sub>               =          the size of the data  
8     payload available to send  
9     to the i-th access terminal;  
10     and  
11     PS<sub>i</sub>                 =          the physical layer packet  
12     size corresponding to R<sub>MAX*i*</sub>.

$\{1, 2, \dots, n\}$  and  $\{1, 2, \dots, n\}$  are the sets of vertices of  $G$  and  $H$  respectively. The vertices of  $G$  are labeled  $v_1, v_2, \dots, v_n$  and the vertices of  $H$  are labeled  $w_1, w_2, \dots, w_n$ . The edges of  $G$  are labeled  $e_1, e_2, \dots, e_m$  and the edges of  $H$  are labeled  $f_1, f_2, \dots, f_p$ . The vertices of  $G$  are labeled  $v_1, v_2, \dots, v_n$  and the vertices of  $H$  are labeled  $w_1, w_2, \dots, w_n$ . The edges of  $G$  are labeled  $e_1, e_2, \dots, e_m$  and the edges of  $H$  are labeled  $f_1, f_2, \dots, f_p$ .